INSTALLATION RUNBOOK FOR MOS + Hillstone FWaaS Plugin Driver

Application Type: **Firewall Policy Management**

Application Version: **1.0**

MOS Version: **7.0**

OpenStack version: **Kilo**

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Document History

Version	Revision Date	Description
1.0	27-04-2016	Initial Version

1 Introduction

The Hillstone FWaaS Plugin Driver enables policy configuration of Hillstone firewall appliances through OpenStack Neutron FWaaS. This document provides a validated reference architecture and offers step-by-step installation instructions for integrating the Hillstone FWaaS Plugin Driver with Mirantis OpenStack. We also discuss limitations of the integration, and describe testing procedures used in validation.

1.1 Target Audience

This document is for OpenStack data center admins, or data center security admins.

2 Application overview

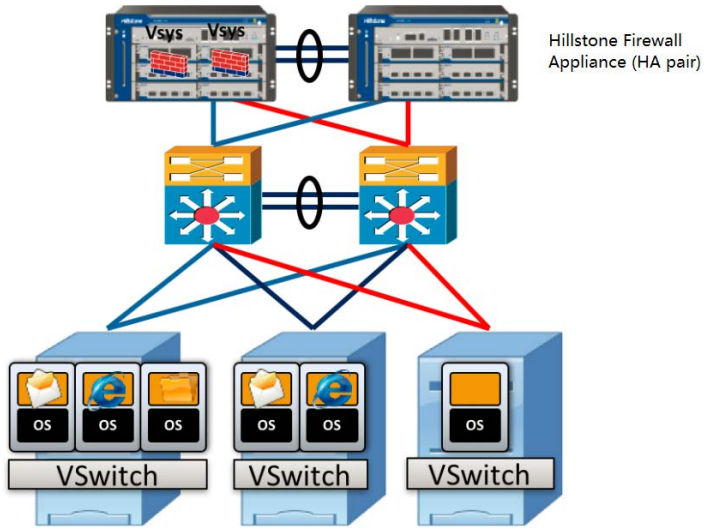
The Hillstone FWaaS (Firewall as a Service) Plugin Driver takes firewall policy configuration from the OpenStack Neutron FWaaS extension, converts it to Hillstone policy format, and sends it to a Hillstone firewall appliance deployed in an OpenStack data center.

Hillstone Networks provides a high performance firewall appliance that can be deployed at the perimeter of a data center to secure North-South traffic. The Firewall appliance provides Web UI, CLI and RESTful API management interfaces for admins to configure firewall policies. With the Hillstone FWaaS Plugin Driver deployed in Mirantis OpenStack, the OpenStack admin can configure firewall policies through the FWaaS plugin, and policies will be pushed to the Hillstone firewall appliance automatically.

OpenStack security groups and the FWaaS plugin can only provide firewall protection on Layer 3 to Layer 4. As a full-featured firewall, the Hillstone firewall appliance can provide not only Layer 2 to L4 firewall, but also offers several Layer 7 protections like Application Identification, IPS, AV, URL filtering, etc. The Firewall appliance can be deployed at the data center perimeter to secure North-South traffic.

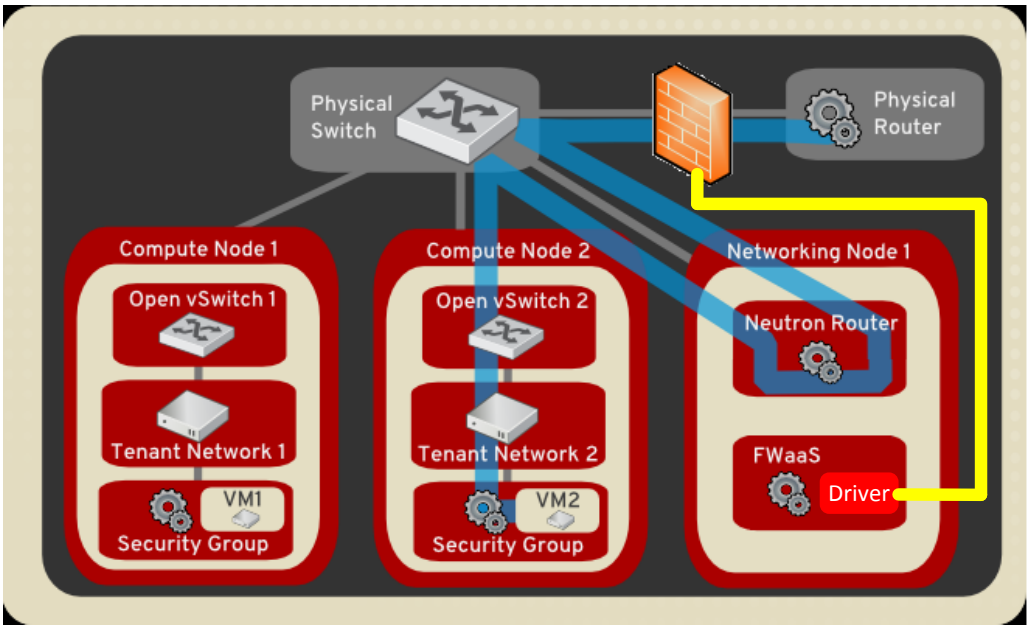
3 Joint Reference Architecture

The Hillstone firewall appliance can be deployed at the perimeter of data center as shown in the following figure:



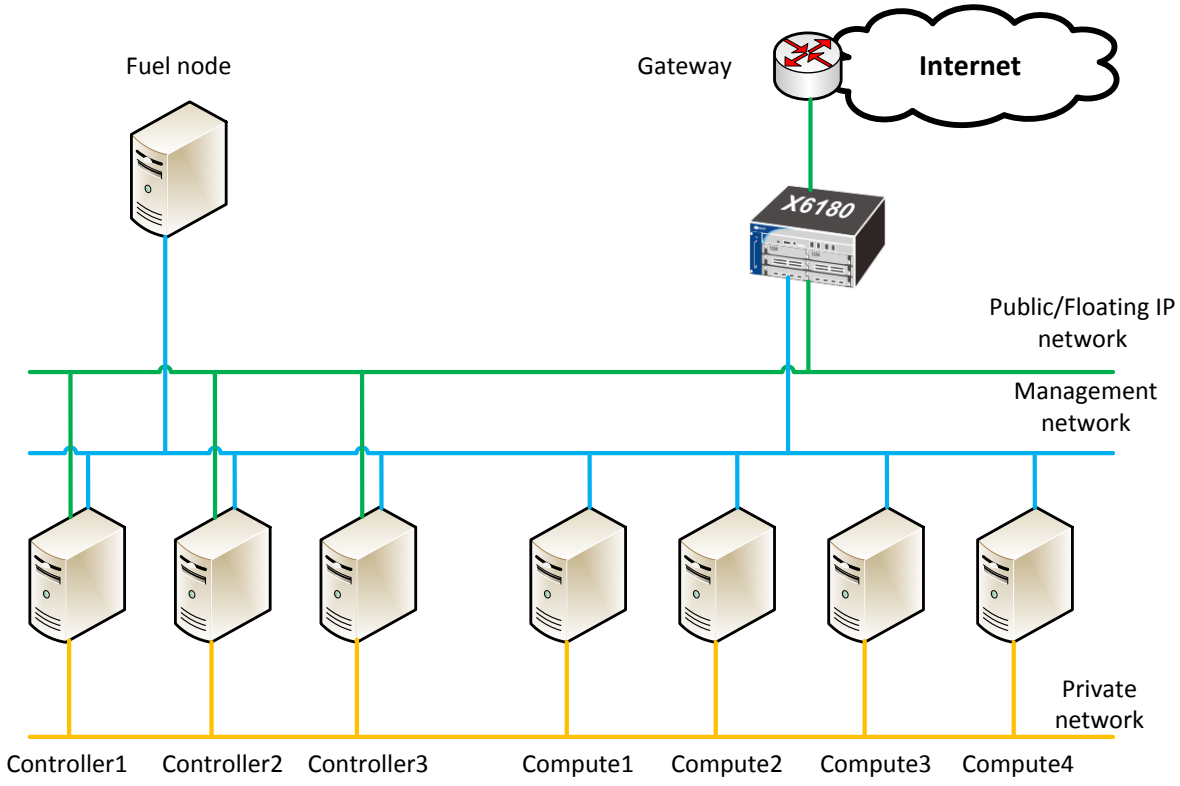
More detail about the Hillstone data center firewall appliance can be found at http://www.hillstonenet.com/our-products/datacenter-next-gen-firewalls-x-series/.

When integrated with Mirantis OpenStack, the firewall appliance is deployed at the data center perimeter, i.e., between OpenStack's external network and the gateway/router to the Internet. The Hillstone FWaaS Plugin Driver is deployed on all network/neutron nodes, and the OpenStack Neutron FWaaS extension is configured to point to it. FWaaS firewall rule configuration sent by the FWaaS Neutron extension to L3-agent is converted to a Hillstone configuration API request and sent to the firewall appliance (shown as the yellow path in the following architecture diagram). In the current release, only one tenant can configure the FWaaS firewall, and firewall policy configuration is based on IPs on the public/floating network.

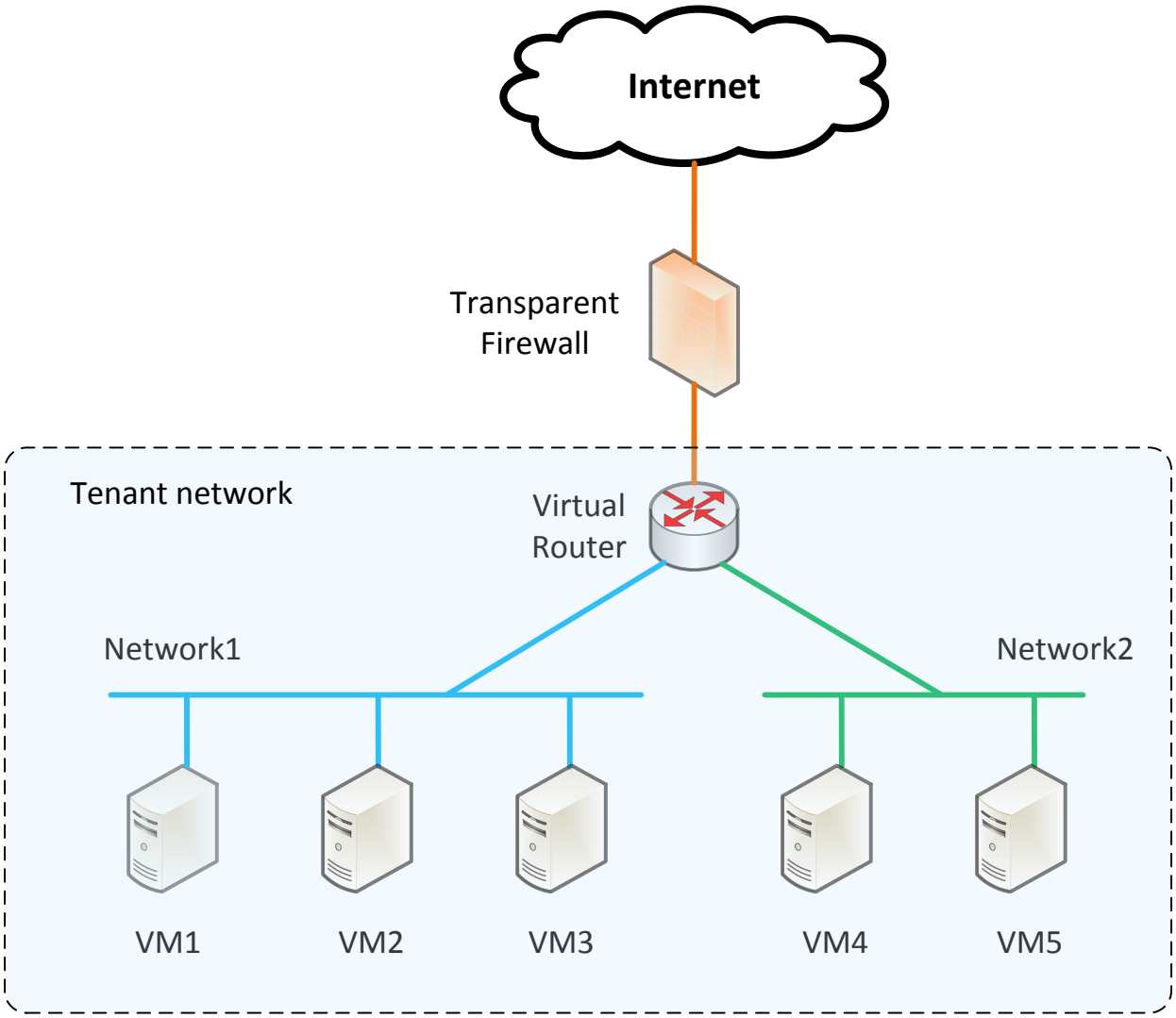


4 Physical & Logical Network Topology

Physical network topology is shown in the following diagram. Compared with a standard Mirantis OpenStack deployment, a Hillstone firewall appliance is deployed between the Public network and the Gateway as a perimeter firewall. The firewall management interface connects to the data center Management network.



The logical network topology is shown in the following diagram. Each tenant manages his own networks, VMs, and virtual routers. The Hillstone firewall is deployed in transparent mode between the tenant virtual router and the Internet. Firewall rules configured through OpenStack's FWaaS plugin are automatically synced to the Hillstone firewall.



5 Installation & Configuration

5.1 Environment preparation

The Hillstone FWaaS Plugin Driver is installed to an existing Mirantis OpenStack 7.0 data center that has the OpenStack Neutron FWaaS extension enabled, and a Hillstone firewall appliance installed. The following instructions provide a (high level) overview of how such a data center

may be deployed. Rack space and power must naturally be provided for the Hillstone firewall appliance (please refer to Hillstone's data sheet for details).

5.2 MOS installation

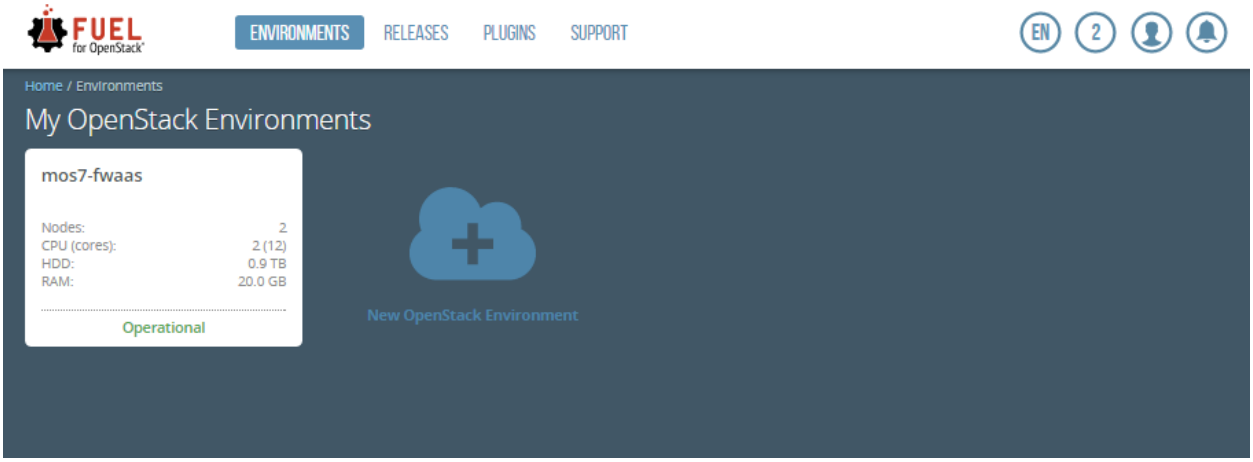
Download and install the Mirantis OpenStack 7.0 .iso and create a Fuel Master (OpenStack cluster deployer) by following Mirantis' instructions:
https://docs.mirantis.com/openstack/fuel/fuel-7.0/

Also enable the Fuel Master to deploy the OpenStack FWaaS Neutron extension by installing the FWaaS Fuel Plugin, as detailed in the following doc:
http://plugins.mirantis.com/docs/f/w/fwaas-plugin/fwaas-plugin-1.1-1.1.0-1.pdf

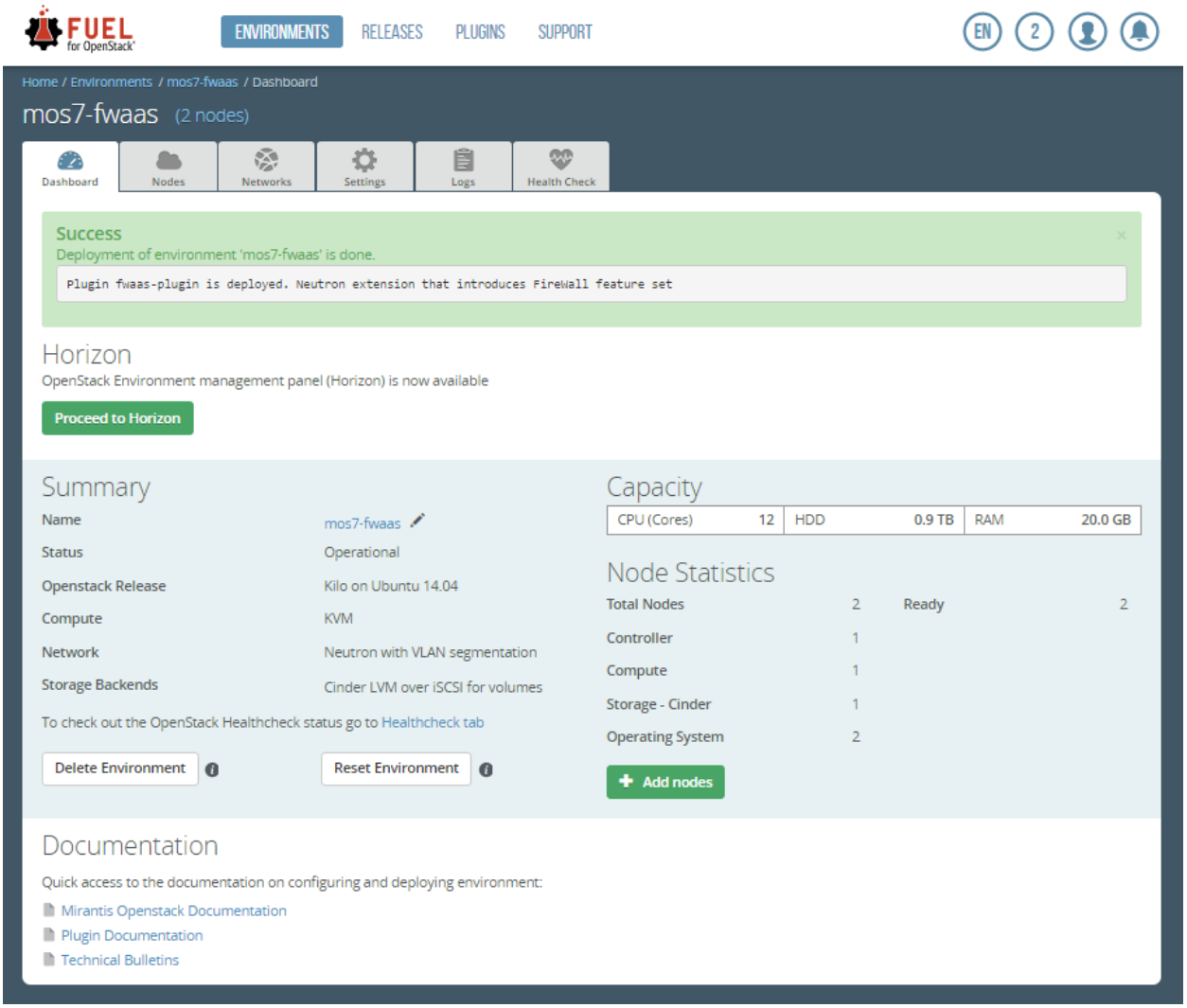
After the FWaaS Fuel Plugin is installed to the Fuel Master, you can use Fuel to configure and create a new OpenStack environment. The environment tested in this document was configured as follows:

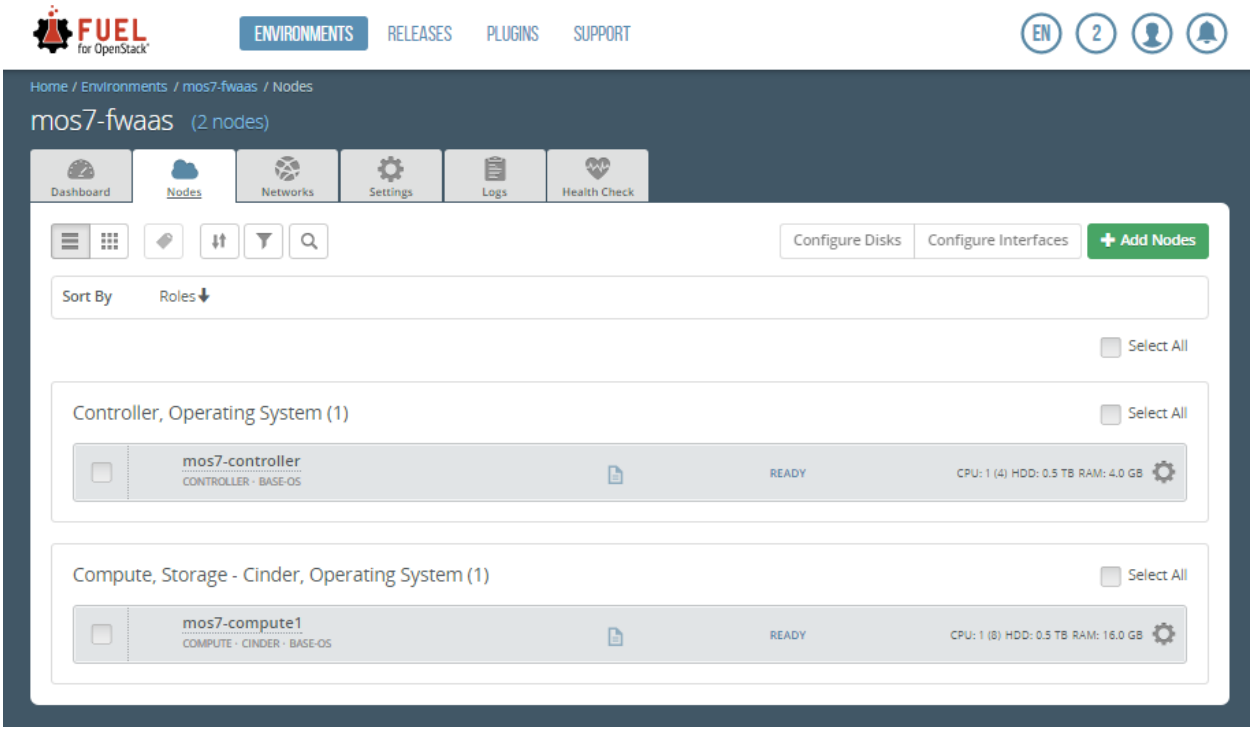
Mirantis Openstack version: MOS7.0 Kilo on Ubuntu 14.04
Networking backend: Neutron with VLANs
Glance backend: Swift
Cinder backend: LVM but no Cinder nodes were installed.
Nodes in the environment: 1 Controller node and 1 Compute node.
FWaaS plugin version: 1.1-1.1.0

In this sample setup, the OpenStack environment is called mos7-fwaas.



The following screen shots show more detail about this OpenStack environment.


FUEL for OpenStack
ENVIRONMENTS
RELEASES
PLUGINS
SUPPORT
EN
2
Home / Environments / mos7-fwaas / Dashboard
mos7-fwaas (2 nodes)
Dashboard
Nodes
Networks
Settings
Logs
Health Check
Success
Deployment of environment 'mos7-fwaas' is done.
Plugin fwaas-plugin is deployed. Neutron extension that introduces Firewall feature set
Horizon
OpenStack Environment management panel (Horizon) is now available
Proceed to Horizon
Summary
Name
mos7-fwaas
Status
Operational
Openstack Release
Kilo on Ubuntu 14.04
Compute
KVM
Network
Neutron with VLAN segmentation
Storage Backends
Cinder LVM over iSCSI for volumes
To check out the OpenStack Healthcheck status go to Healthcheck tab
Delete Environment
Reset Environment
Capacity
CPU (Cores) 12
HDD 0.9 TB
RAM 20.0 GB
Node Statistics
Total Nodes 2
Ready 2
Controller 1
Compute 1
Storage - Cinder 1
Operating System 2
Add nodes
Documentation
Quick access to the documentation on configuring and deploying environment:
Mirantis Openstack Documentation
Plugin Documentation
Technical Bulletins


FUEL for OpenStack
ENVIRONMENTS
RELEASES
PLUGINS
SUPPORT
EN
2
Home / Environments / mos7-fwaas / Nodes
mos7-fwaas (2 nodes)
Dashboard
Nodes
Networks
Settings
Logs
Health Check
Configure Disks
Configure Interfaces
+ Add Nodes
Sort By
Roles
Select All
Controller, Operating System (1)
Select All
mos7-controller
CONTROLLER · BASE-OS
READY
CPU: 1 (4) HDD: 0.5 TB RAM: 4.0 GB
Compute, Storage - Cinder, Operating System (1)
Select All
mos7-compute1
COMPUTE · CINDER · BASE-OS
READY
CPU: 1 (8) HDD: 0.5 TB RAM: 16.0 GB

FUEL for OpenStack

ENVIRONMENTS | RELEASES | PLUGINS | SUPPORT

EN 2

Home / Environments / mos7-fwaas / Networks

mos7-fwaas (2 nodes)

Dashboard | Nodes | Networks | Settings | Logs | Health Check

Network Settings

Neutron with VLAN segmentation

Public

	Start	End
IP Range	10.1.1.100	10.1.1.109
CIDR	10.1.1.0/24	
Use VLAN tagging		
Gateway	10.1.1.253	
Floating IP ranges	10.1.1.110	10.1.1.119

Storage

CIDR	192.168.21.0/24
Use VLAN tagging	21

Management

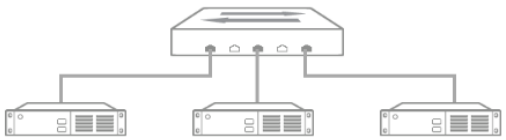
CIDR	192.168.20.0/24
Use VLAN tagging	20

Neutron L2 Configuration

VLAN ID range	110	119
Base MAC address	fa:16:3e:00:00:00	

Neutron L3 Configuration

Internal network CIDR	192.168.111.0/24
Internal network gateway	192.168.111.1
Guest OS DNS Servers	8.8.4.4
	8.8.8.8

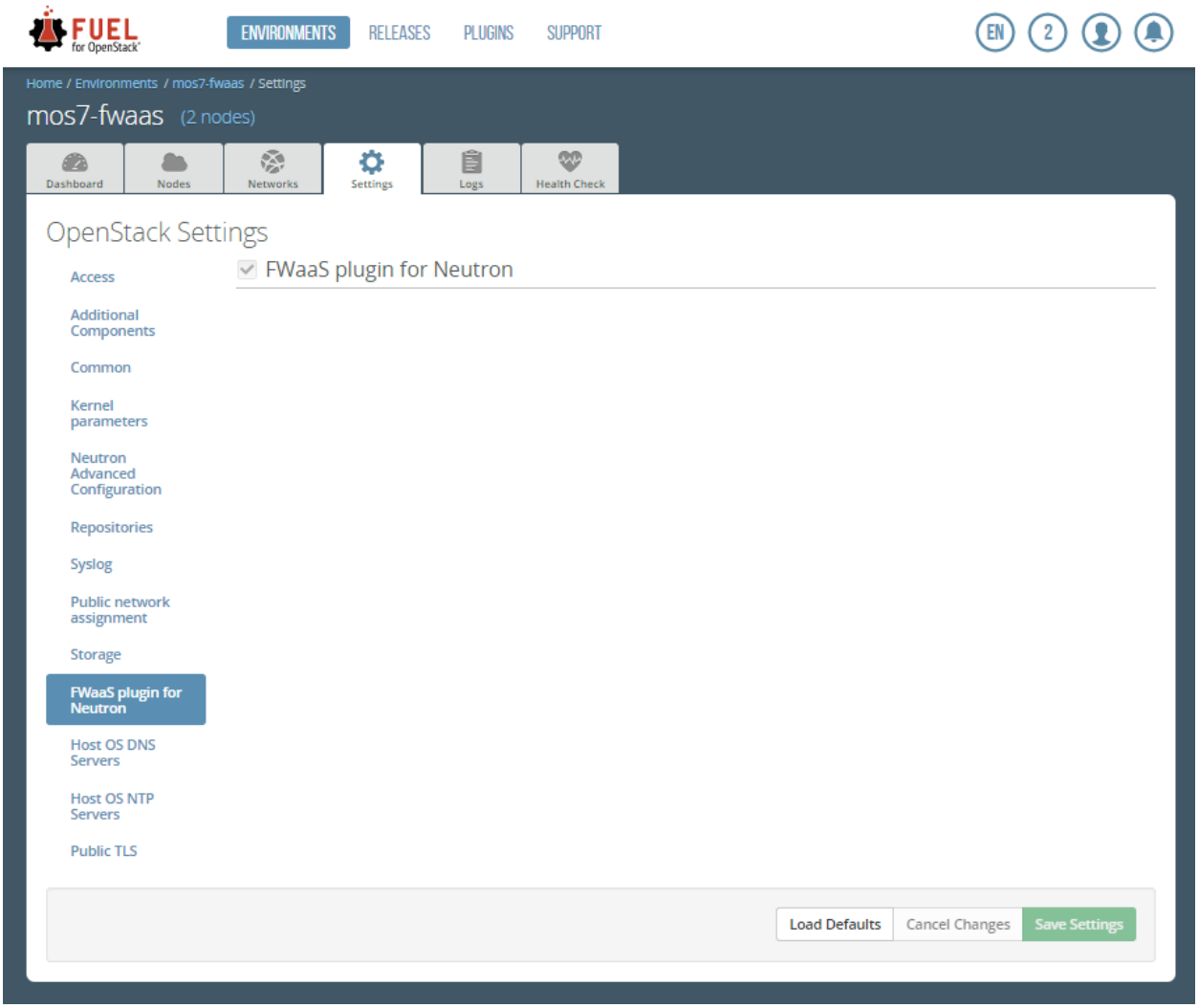


Network verification performs the following checks:

1. L2 connectivity checks between every node in the environment.
2. DHCP discover check on all nodes.
3. Packages repo connectivity check from master node.
4. Packages repo connectivity check from slave nodes via public & admin (PXE) networks.

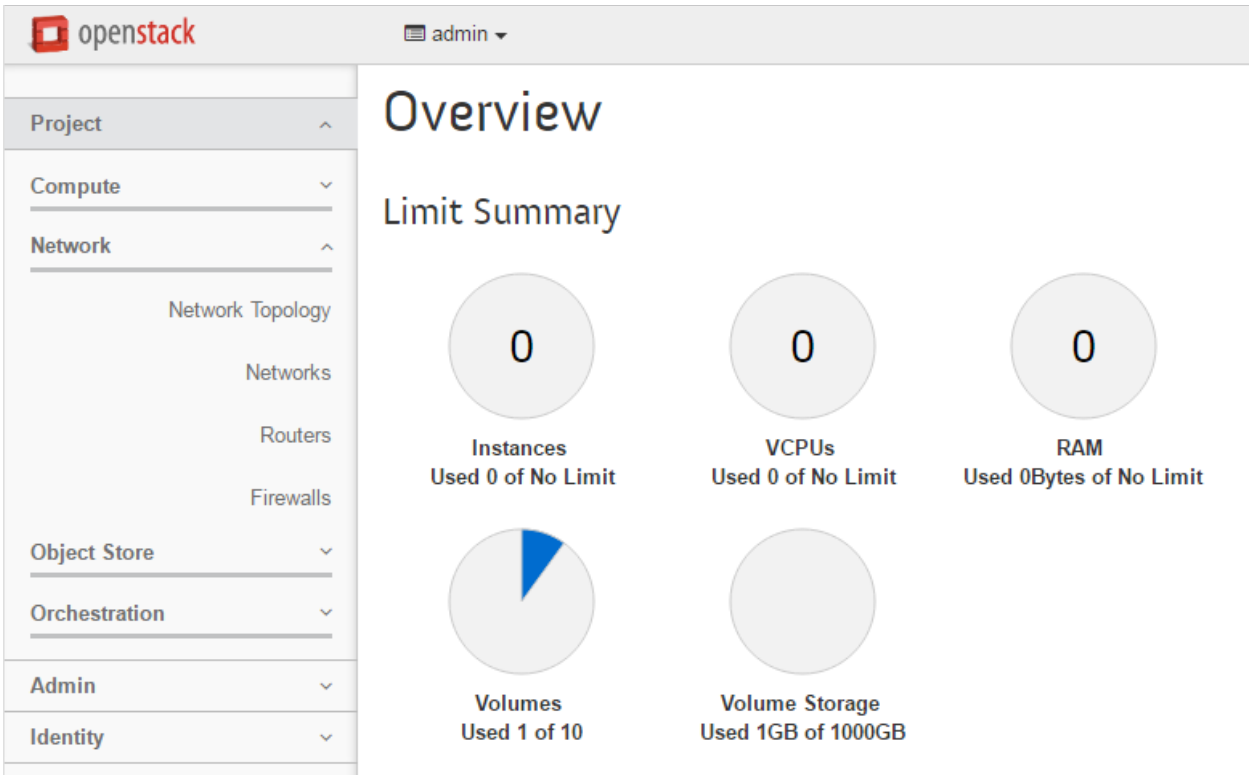
Verification succeeded. Your network is configured correctly.

Verify Networks | Cancel Changes | Save Settings



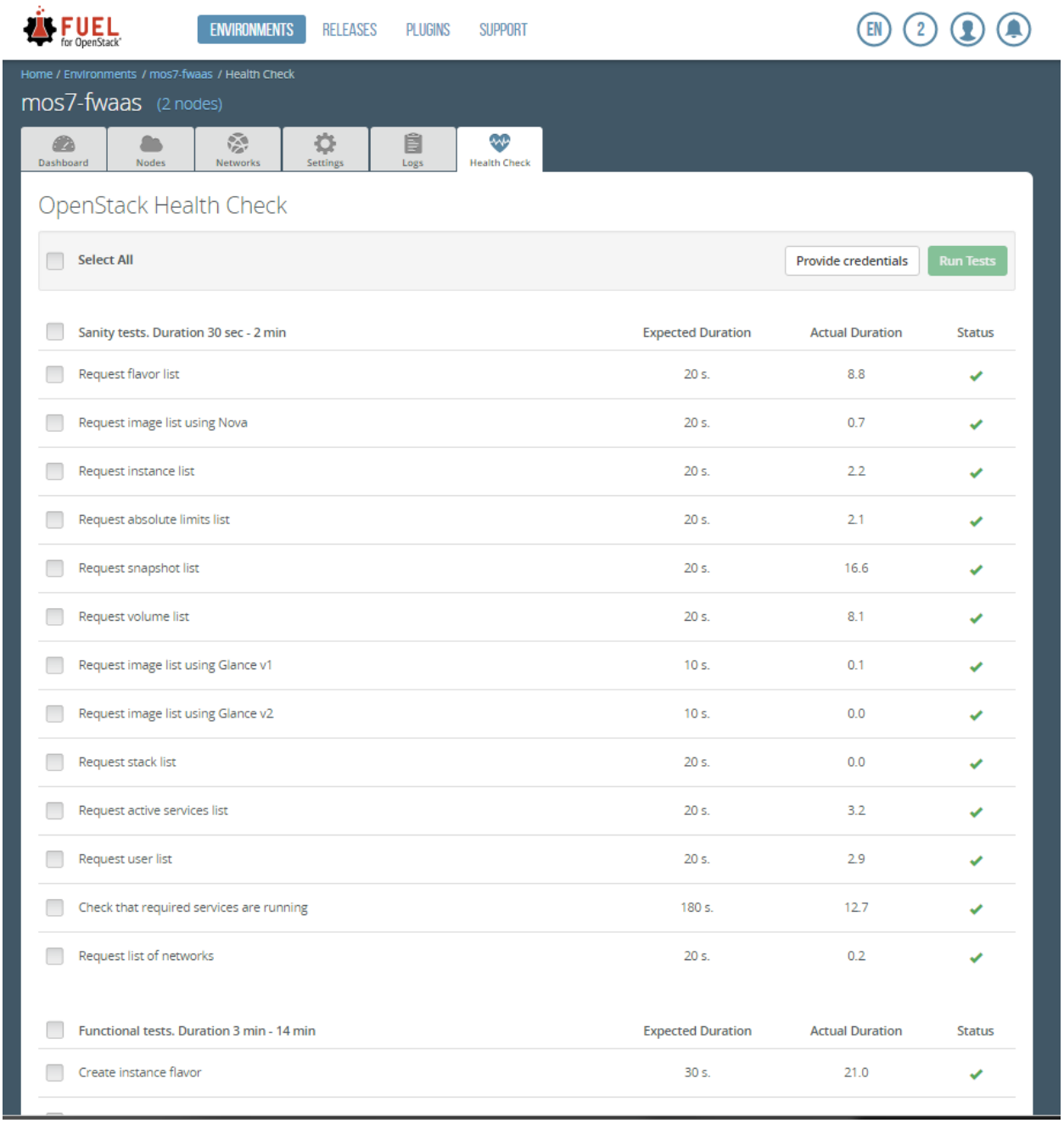
After installing the FWaaS Plugin on the Fuel Master node, you must enable it by checking “FWaaS plugin for Neutron” on Fuel's Settings page before deploying the environment. Other options on the Settings page can remain as default.

After deploying this environment, login to mos7-fwaas Horizon, and double check that the Firewalls tab is available under Network.



5.2.1Health Check Results

The Health Check results are shown in the following:

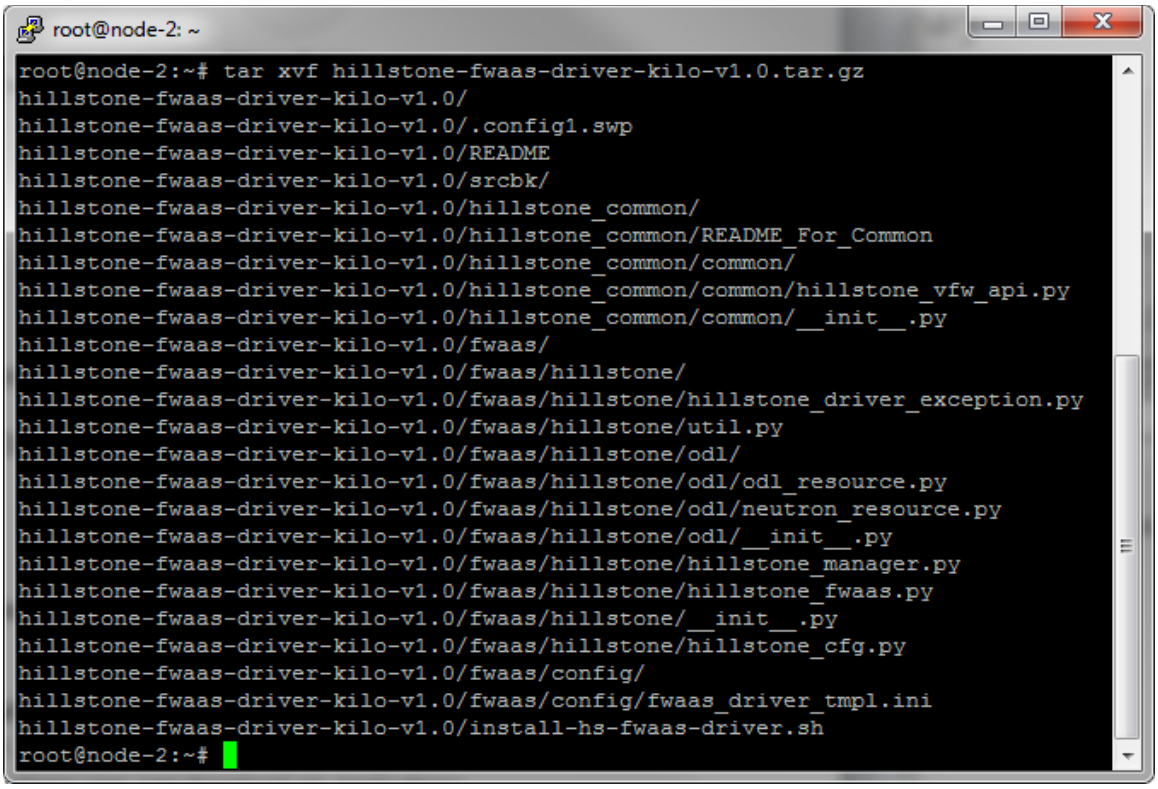


5.3 Hillstone FWaaS Plugin Driver installation steps

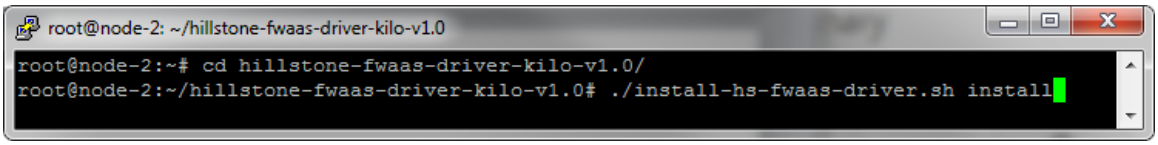
Download the Hillstone FWaaS Plugin Driver, hillstone-fwaas-driver-kilo-v1.0.tar.gz, from the following url:

http://www.hillstonenet.com/wp-content/uploads/hillstone-fwaas-driver-kilo-v1.0.tar.gz

Save the tar file on the target cluster's main OpenStack Controller node. Extract files as follows:



Run the following command as root to install the Hillstone FWaaS Plugin Driver:



During installation, the installation script asks the admin to provide several inputs. Details of each input are as follows:

Firewall Management IP

Management IP for the Hillstone firewall appliance. This should be reachable from the Controller through the Management network.

Firewall Management http port

http port for the firewall appliance web management interface (default 80).

Firewall Management ssh port

ssh port for the firewall appliance cli management interface (default 22).

API method

API method the driver will use to communicate with the firewall appliance (default is RestAPI).

Hillstone Firewall deployment method

The driver can support multiple deployment methods for the Hillstone firewall. The deployment tested here was 'Firewall Appliance.'

OS_TENANT_NAME

OS_USERNAME

OS_PASSWORD

OS_AUTH_URL

OS_REGION_NAME

The above parameters authenticate the OpenStack admin user and toplevel tenant. They can be retrieved from the openrc.sh file downloaded from Horizon (Compute->Access & Security->API Access tab).

Protected tenant name

The tenant name that will be protected by the firewall.

Firewall port that connects to datacenter network

The name of the firewall port that connects to the data center network.

Firewall port that connects to Internet

The name of the firewall port that connects to the Internet.

Firewall admin user name

Firewall admin user name (default *hillstone*).

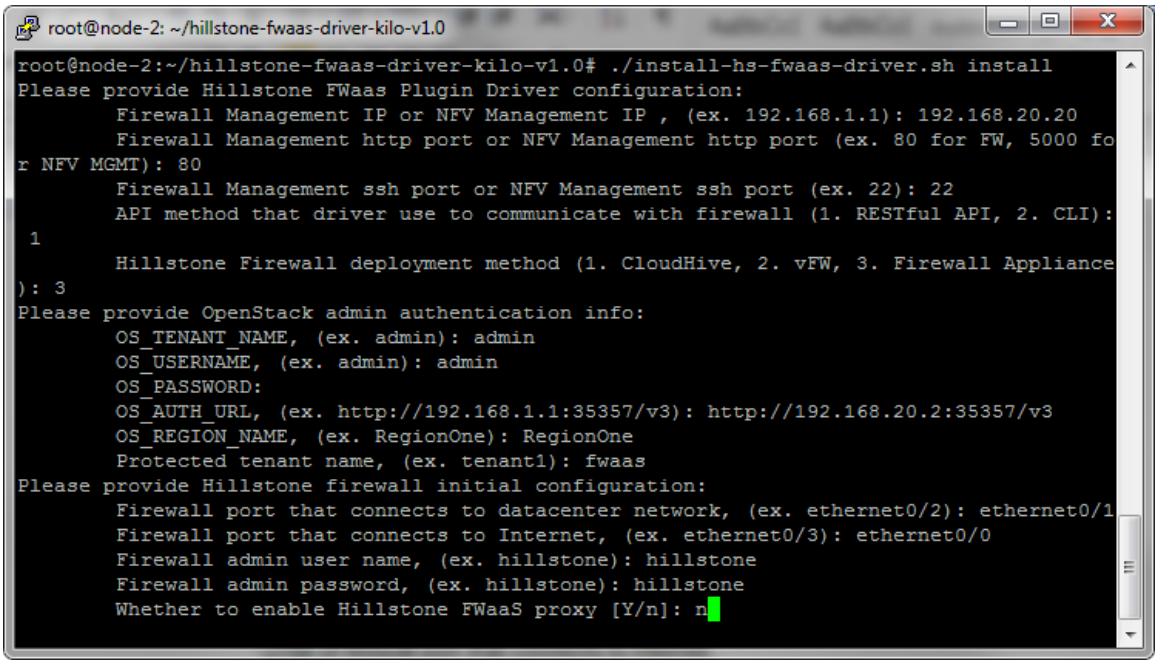
Firewall admin password

Firewall admin user password (default *hillstone*).

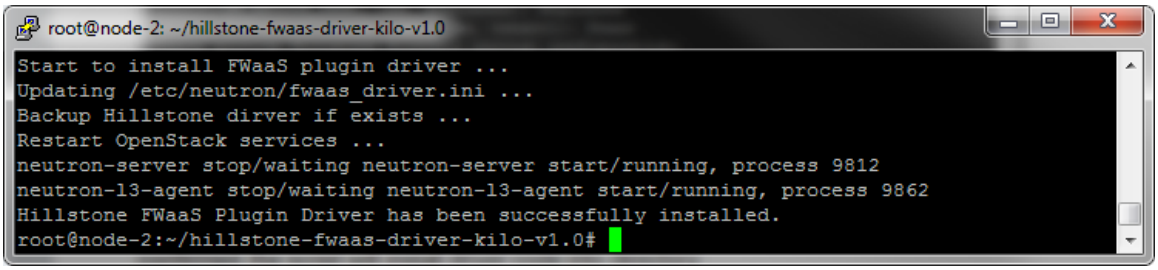
Whether to enable Hillstone FWaaS proxy

FWaaS proxy is not required in this deployment.

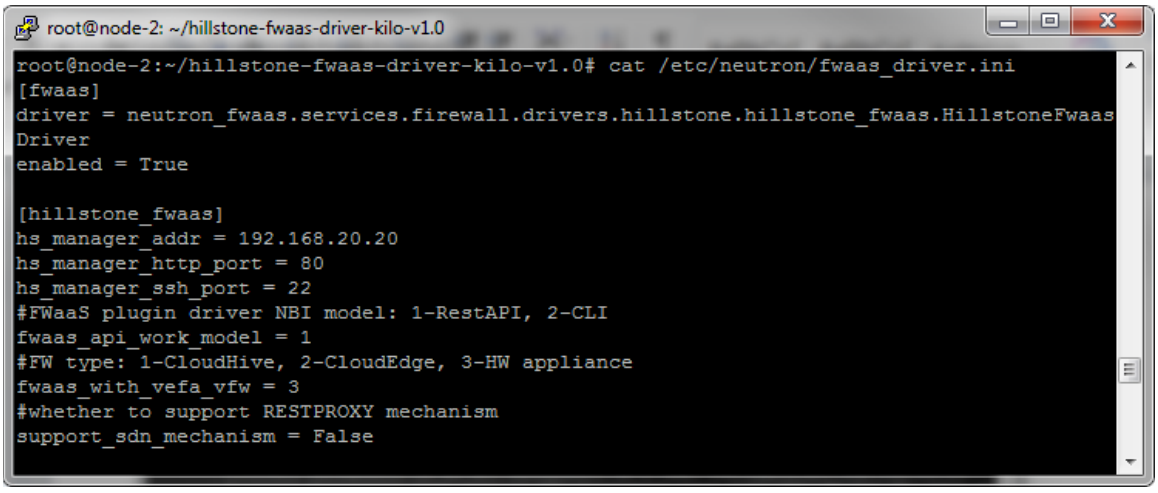
For this deployment, inputs were as follows:



After input of the above parameters, the installation script will ask the admin to confirm the input. If confirmed, the script will install driver code into the directory /usr/lib/python2.7/dist-packages/neutron_fwaas/services/firewall/drivers/. Neutron-server and neutron-l3-agent services will be restarted at the end of installation.



To confirm the installation, admin can check /etc/neutron/fwaas_driver.ini.



5.4 Limitations

Limitation 1:
This release of Hillstone FWaaS Plugin Driver only supports firewall appliances with StoneOS release 5.5R1 and above.

Limitation 2:
This release of Hillstone FWaaS Plugin Driver only supports firewall configuration for one tenant, as specified during installation.

5.5 Testing

5.5.1 Test cases

The Hillstone firewall appliance is deployed at the OpenStack data center perimeter. The firewall can provide security for North-South traffic between VMs in the data center and

machines on the Internet. Firewall policies configured using the OpenStack FWaaS extension are automatically synchronized to the Hillstone firewall appliance. The following test cases demonstrate how security can be configured on the Hillstone firewall appliance to protect VMs running in the data center.

Test case 1 - Provide security to server VM
This test case demonstrates how firewall policy can be configured to provide security to a server VM. With the right policy configuration, only allowed traffic can access a server VM in the data center. All other traffic is blocked.

This test case includes the following steps:
Step 1: Start a server VM, server1, on the server network. Assign the floating IP, 10.1.1.112 to this server1 VM.
Step 2: Access this floating IP from external network with the following applications: ping, http, and ssh.
Step 3: Configure three firewall rules for server1, add them to a policy, and create a firewall through the FWaaS plugin. The order of these rules will be:

Allow http to the floating IP
Allow ping to the floating IP
Deny all protocols to the floating IP

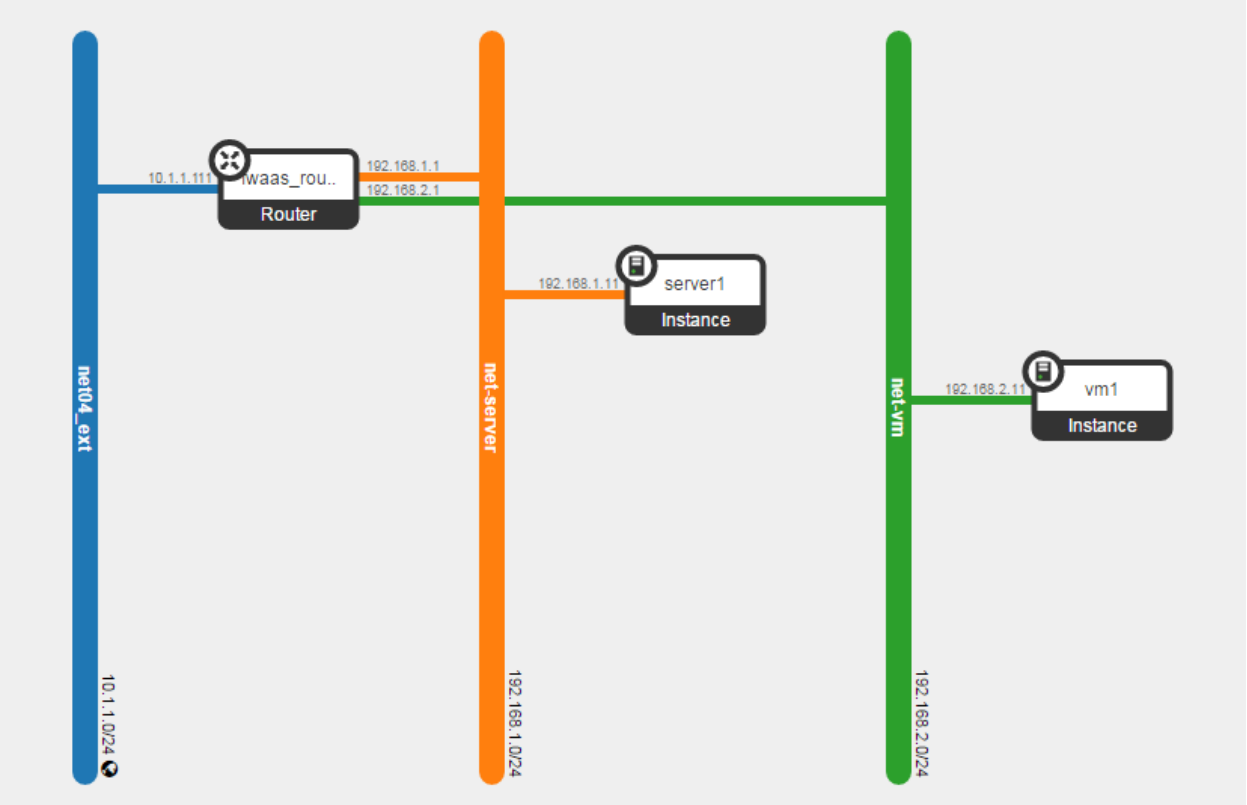
These rules will only allow http and ping to reach the server1 VM, but block all other protocols.
Step 4: Login to the Hillstone firewall appliance and check if the above FWaaS firewall rules are configured on Hillstone firewall.
Step 5: Access this floating IP from the external network via ping, http, and ssh, and check which protocols are allowed or denied.

Test case 2 – Provide security to host VM
This test case demonstrates how the Hillstone Firewall can provide traffic control for northbound traffic. User VMs in the data center can access the Internet. If certain types of access creates risk for these VMs, this type of access can be blocked by firewall rules.

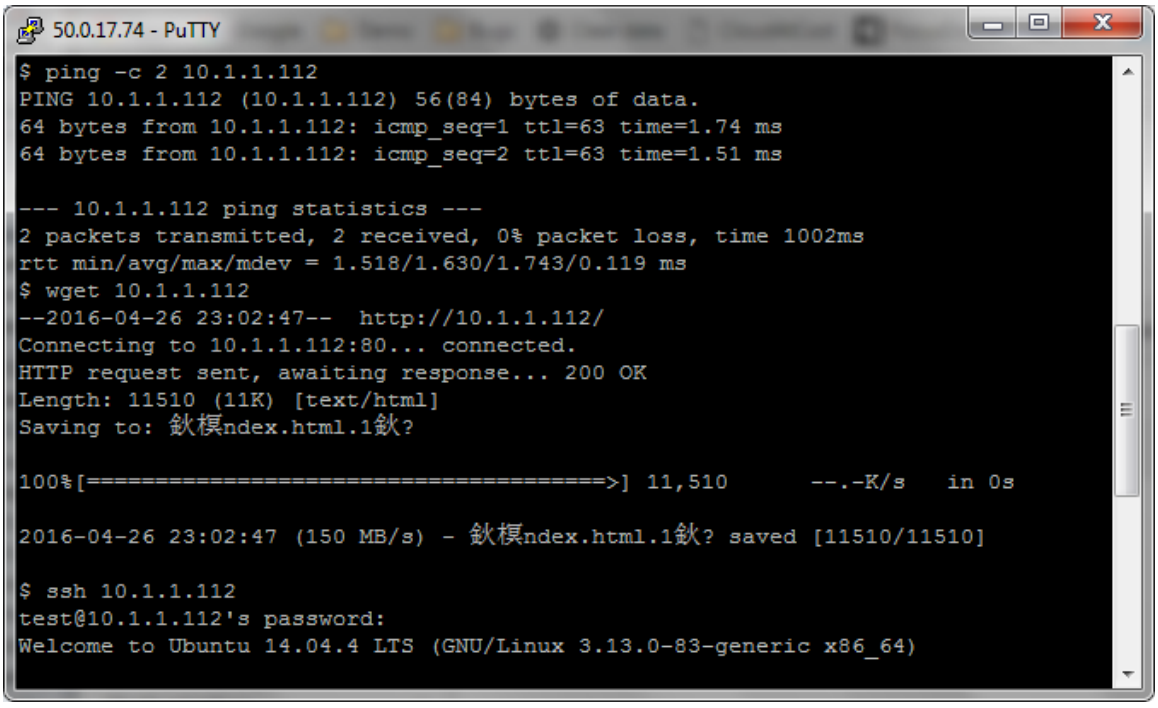
This test case includes the following steps:
Step 1: Start a user VM, vm1, on the VM network. To reach the Internet, all guest VMs use the IP of router interface, 10.1.1.111. Ping and connect an external ftp server from vm1.
Step 2: Create a firewall rule that blocks the ftp TCP port. Add this rule to the policy.
Step 3: Run the same traffic test as in Step 1.

5.5.2 Test Results

Test case 1 results
Step1: The VM and network configuration is as follows:



Step 2: From a PC on the external network, try to access the floating IP of server1. The traffic result is as follows:



The host on the external network can access the server1 VM through the Hillstone firewall with ping, http, and ssh. At this stage, no firewall policy has been configured.

Step 3: The configuration of FWaaS firewall rules, policy and firewall are as follows:

Firewalls | Firewall Policies | Firewall Rules

+ Add Rule | ✖ Delete Rules

Name	Protocol	Source IP	Source Port	Destination IP	Destination Port	Action	Enabled	In Policy	Actions
south-server1-http-allow	TCP	-	-	10.1.1.112/32	80	ALLOW	Yes	policy-fwaas	Edit Rule
both-any-any-allow	ANY	-	-	-	-	ALLOW	Yes	policy-fwaas	Edit Rule
south-server1-ping-allow	ICMP	-	-	10.1.1.112/32	-	ALLOW	Yes	policy-fwaas	Edit Rule
south-server1-all-deny	ANY	-	-	10.1.1.112/32	-	DENY	Yes	policy-fwaas	Edit Rule

Displaying 4 items

Firewalls | Firewall Policies | Firewall Rules

+ Add Policy | ✖ Delete Policies

Name	Rules	Audited	Actions
policy-fwaas	south-server1-http-allow, south-server1-ping-allow, south-server1-all-deny, both-any-any-allow	No	Edit Policy

Displaying 1 item

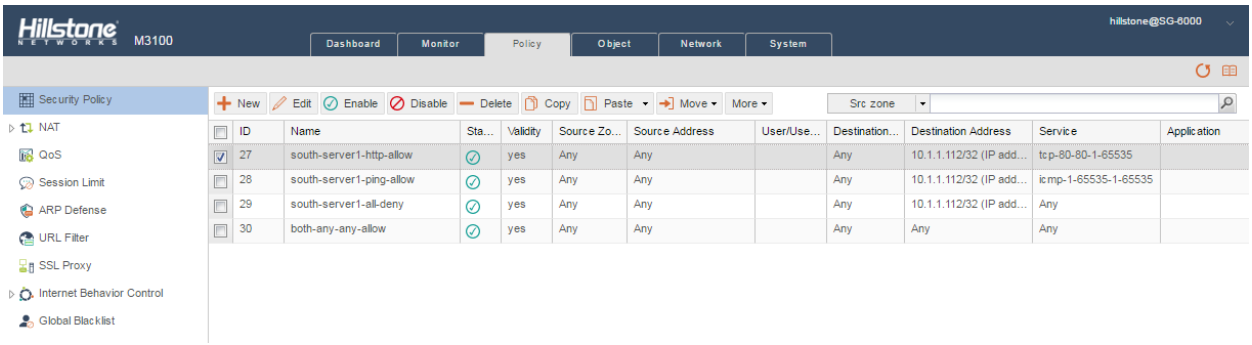
Firewalls | Firewall Policies | Firewall Rules

+ Create Firewall | ✖ Delete Firewalls

Name	Policy	Associated Routers	Status	Admin State	Actions
fw-fwaas	policy-fwaas	fwaas_router1	Active	UP	Edit Firewall

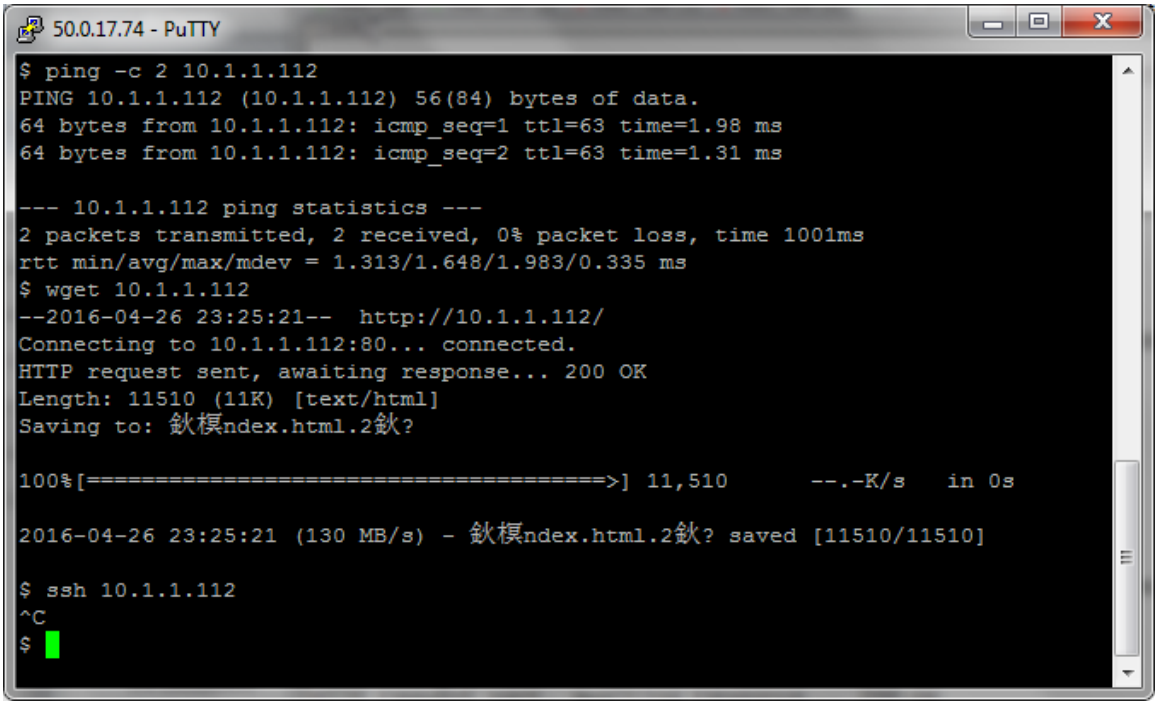
Displaying 1 item

Step 4: Login to the Hillstone firewall web management UI. Review the current policy rules:



This policy configuration page shows that the firewall rules configured via the FWaaS plugin have been automatically transferred to the Hillstone firewall.

Step 5: Run the same traffic test as in Step 2 from the host on the external network. Traffic results are as follows:

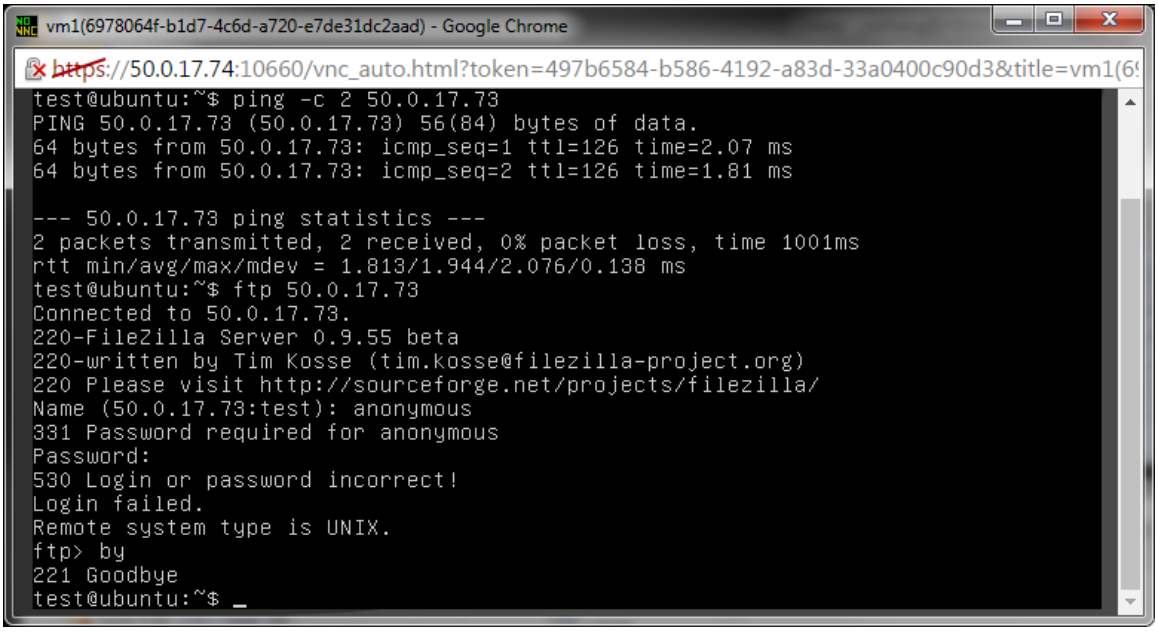


Ping and http can now go through the Hillstone firewall since these protocols are allowed by the firewall policy. But ssh cannot connect because it is blocked by a firewall rule.

The above test results demonstrate that firewall rules configured via the OpenStack FWaaS extension can be automatically transferred to the Hillstone firewall appliance by the driver. Data center admins can define firewall configurations using the FWaaS extension and these configurations are implemented on the Hillstone perimeter firewall automatically.

Test case 2 results

Step 1: VM vm1 can ping or ftp to an ftp server on the Internet.



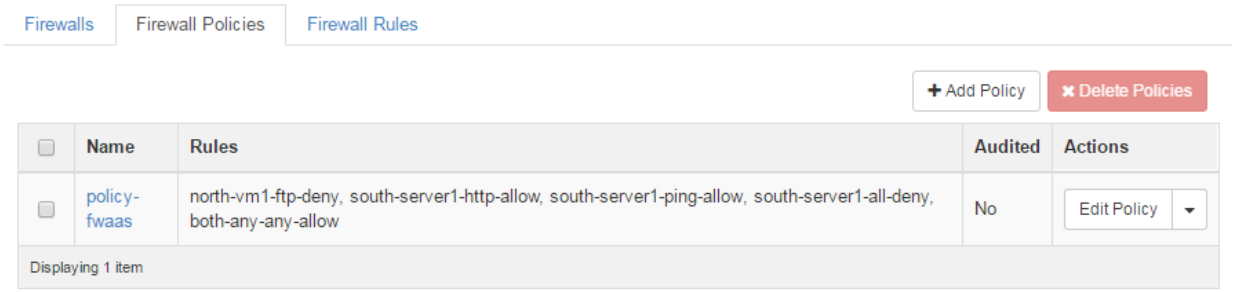
Step 2: A Deny firewall rule is created with 10.1.1.111/32 as the source IP, and TCP port 21 as the destination port. This rule is added into the policy, thus added to the existing firewall.

Firewalls | Firewall Policies | Firewall Rules

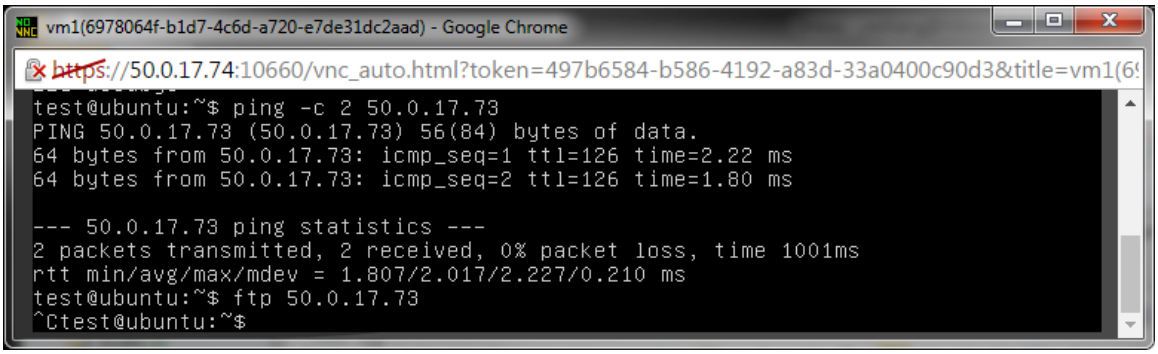
+ Add Rule | ✖ Delete Rules

Name	Protocol	Source IP	Source Port	Destination IP	Destination Port	Action	Enabled	In Policy	Actions
south-server1-http-allow	TCP	-	-	10.1.1.112/32	80	ALLOW	Yes	policy-fwaas	Edit Rule
both-any-any-allow	ANY	-	-	-	-	ALLOW	Yes	policy-fwaas	Edit Rule
south-server1-ping-allow	ICMP	-	-	10.1.1.112/32	-	ALLOW	Yes	policy-fwaas	Edit Rule
south-server1-all-deny	ANY	-	-	10.1.1.112/32	-	DENY	Yes	policy-fwaas	Edit Rule
north-vm1-ftp-deny	TCP	10.1.1.111/32	-	-	21	DENY	Yes		Edit Rule

Displaying 5 items



Step 3: Run the same ping and ftp test again. Ping can go through, but ftp now fails to connect to the remote server, because the control connection is blocked by the Hillstone firewall.



Test case 2 demonstrates that firewall rules can be created to limit Internet access by data center VMs.